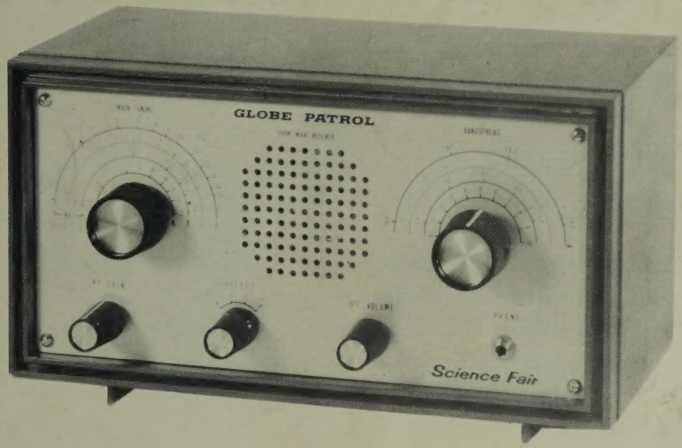
Instruction Mannual

PRICE $3.50

Science Fair™

GLOBE PATROL



CAT. NO. 28-206

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GLOBE PATROL
SHORT WAVE RECEIVER

Your SCIENCE FAIR™ Globe Patrol short wave receiver is a four-band, three transistor receiver which can tune stations all the way from the AM broadcast band to thirty Megahertz. You can listen to amateur stations, foreign broadcast stations, ships at sea, aircraft, and many other exciting radio services, just by switching bands with a simple turn of a knob. This compact transistorized receiver has a main tuning dial and a bandspread dial, RF gain circuit, a choice of earphone or speaker output, and front panel band selection.

The transistor circuitry in the Globe Patrol receiver provides an excellent means of learning the theory and construction of modern receiver circuits, and is a worthwhile radio to have for your continued enjoyment as a short wave listener. The circuit is entirely of solid-state design ; there are no filaments or components that require separate batteries or power supplies. The one power supply circuit with a full-wave rectifier of silicon diodes and a three-section RC filter, converts 110-120 volt house current to the DC voltages needed to operate the three transistor stages and audio output. Where house current is not available, a nine-volt battery can be substituted merely by connection of the PC board. The receiver circuit consists of medium high gain transistors and a diode detector, and the parts are mounted on a printed circuit board with the conductor circuits etched from the copper laminate of the board.

The main characteristic of a regenerative receiver is its high sensitivity to incoming signals. You will notice that the Globe Patrol receiver comes alive when the power is turned on. You will hear noises like static and squeals while tuning. These are the regeneration sounds caused by the signals from the transmitting stations. You will have to tune carefully to these signals for clear reception. The higher selectivity of a regenerative receiver produces clearer signals due to a reduction of overall response to noise. Regeneration also provides good matching to the antenna signal, and the matching automatically adjusts itself as the frequency is changed while tuning. The high sensitivity, high selectivity, good antenna matching, and a simple, but effective technique of selective amplification of the resonant signals, assure a high efficiency of operation in the Globe Patrol receiver.

The SCIENCE FAIR™ Globe Patrol short wave receiver comes as a kit with a beautiful plastic case, aluminum front panel, easy to read dials, and convenient controls. The kit includes a printed circuit board with premounted quality components and all the wire, solder, and electrical components needed for complete assembly. By following the simple, clear step-by-step instructions in this manual, you can wire and assemble your receiver in approximately 10 hours working time (working slowly for a thorough understanding).

FEATURES

Continuous AM reception from 550 KHz to 30 MHz in four bands (Standard AM Broadcast plus three short-wave bands)

Calibrated bandspread tuning on all four bands (on the Broadcast band it is used for fine tuning)

Band selection control on front panel
RF GAIN control for increasing the sensitivity to weak signals
All solid-state for instant reception (no warmup time required)
Front panel jack for earphone
External connection for antenna and ground
Built-in 2-1/2 inch PM speaker

CONSTRUCTION

Construction of the Globe Patrol receiver has been well planned before delivery to you; all that is needed is some basic wiring and assembly. The construction of the case and location of all parts is a specialized part of indusstrial electronics which is normally performed by mechanical engineers and "packaging" engineers. Since the intent of this kit is to provide instructional material for electronics engineering, the circuit construction is emphasized, and this task is mainly concerned with mounting and interconnection of the components and wiring.

Following the step-by-step procedures given here, an experimenter can learn the operating principles of the receiver in a practical, easy-to-understand manner by actually making all of the connections. Diagrams in this instruction manual show the placement of the premounted components and mounting positions for the small parts. Connection of the leads for these parts is through the holes in the board to the copper conductor foil on the other side of the board. (The foil side faces the front of the receiver.)

For this wiring, the PC board (printed circuit board) should be removed from the case and balanced on the shafts of the premounted components. To remove the PC board, remove the five knobs on the front panel by loosening the set screws and pulling the knobs off gently. Instructions for replacement of the knobs and for correct orientation of the white pointer line are given in the procedures for final assembly. Remove the four hex nuts holding the PC board in place on the inside of the case, and then the PC board with its mounted components will be removable. (Do not loosen the screws which hold the transformer in place.)

A minimum number of hand tools are required for assembling and wiring the Globe Patrol kit. The necessary tools are listed below.

Long-nose pliers, six-inch
Diagonal cutting pliers
Screwdriver, six to seven inch, 1/4 inch blade
Screwdriver, four to five inch, 1/8 inch blade
Electric soldering iron, 25 watt pencil iron

Wire and solder are provided in the kit. There is sufficient wire precut to the lengths needed, and sufficient solder to complete the wiring. If for any reason you obtain additional solder to use in wiring this kit, use only resin core solder.

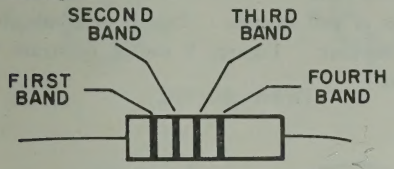
COLOR CODE

Color coding is used in the wiring of the Globe Patrol kit to identify values of resistors, and to identify the leads of major components. The wire colors are specified in the step-by-step procedures; the resistor color code is shown below. Each color band on resistors represents a number as shown on the color code chart, and when combined indicates the value of resistance in ohms. The meanings of the color bands are explained here.

First Band	The first significant figure of the resistance in ohms
Second Band	The second significant figure of the resistance in ohms
Third Band	Decimal multiplier, or the number of digits that should be added to the first two significant figures
Fourth Band	Tolerance of the resistor in percent. If there is no band, the tolerance is 20%

The resistors in this kit can be identified by their color bands as follows:

Example:



First band, yellow	4
Second band, purple	7
Third band, orange	000
Fourth band, silver	10%
Value of resistor	47,000 ohms ± 10%

This may be written as 47K (K=thousands)

Values of the resistors supplied with this kit are as follows:

100 ohm - Brown, black, brown
220 ohm - Red, red, brown
330 ohm - Orange, orange, brown
1K - Brown, black, red
4.7K - Yellow, purple, red
10K - Brown, black, orange
47K - Yellow, purple, orange
100K - Brown, black, yellow

COLOR CODE CHART

COLOR	FIRST BAND	SECOND BAND	THIRD BAND	FOURTH BAND
Black	0	0	-	
Brown	1	1	0	
Red	2	2	00	
Orange	3	3	000	
Yellow	4	4	0000	
Green	5	5	00000	
Blue	6	6	000000	
Purple	7	7	0000000	
Grey	8	8	00000000	
White	9	9	000000000	
Gold				5%
Silver				10%
None				20%

SOLDERING TECHNIQUES

The performance of your Globe Patrol receiver will depend to a great extent on the way the soldered connections are made. Although soldering is easy, some precautions must be observed to insure good electrical contacts and adequate mechanical strength. The terminal, the wire, and the tip of the soldering iron must be clean and free of excess solder. Use only good resin core solder and apply only enough heat to the terminals to allow the solder to flow. A pencil iron such as Radio Shack 64-2175 with a 1/8 inch tip is recommended.

When soldering wire to terminals, or to the copper foil, the soldering iron should be placed lightly in contact with the wire and the terminal so that all members of the joint can be brought to the correct temperature quickly and together, allowing the solder to flow freely into the joint. Allow just enough solder to flow to make the connection and remove the iron to let the joint cool. Prolonged heating can cause damage to surrounding components, the phenolic board and foil, and to insulation. Some of the components, in this kit can be damaged py excessive heat, but by using the correct procedure, damage should not occur. When soldering the leads of resistors, diodes, and transistors, hold the soldering iron on the joint for only one or two seconds. This is long enough to solder the joint, but not long enough to cause damage to the part. Figures 1 and 2 illustrate the correct soldering technique for foil and terminal connections.

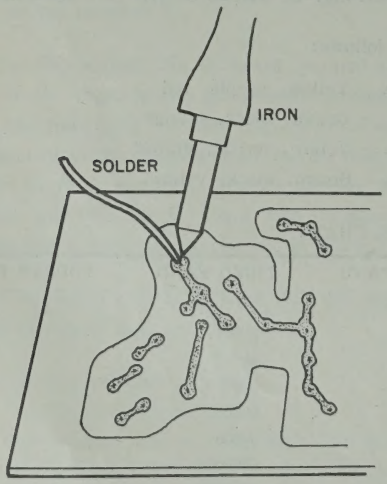


Figure 1 Foil Connections

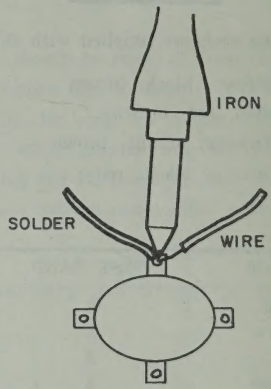


Figure 2 Terminal Connections

The following diagrams are presented as an aid in identifying parts and the correct terminals for making electrical connections.

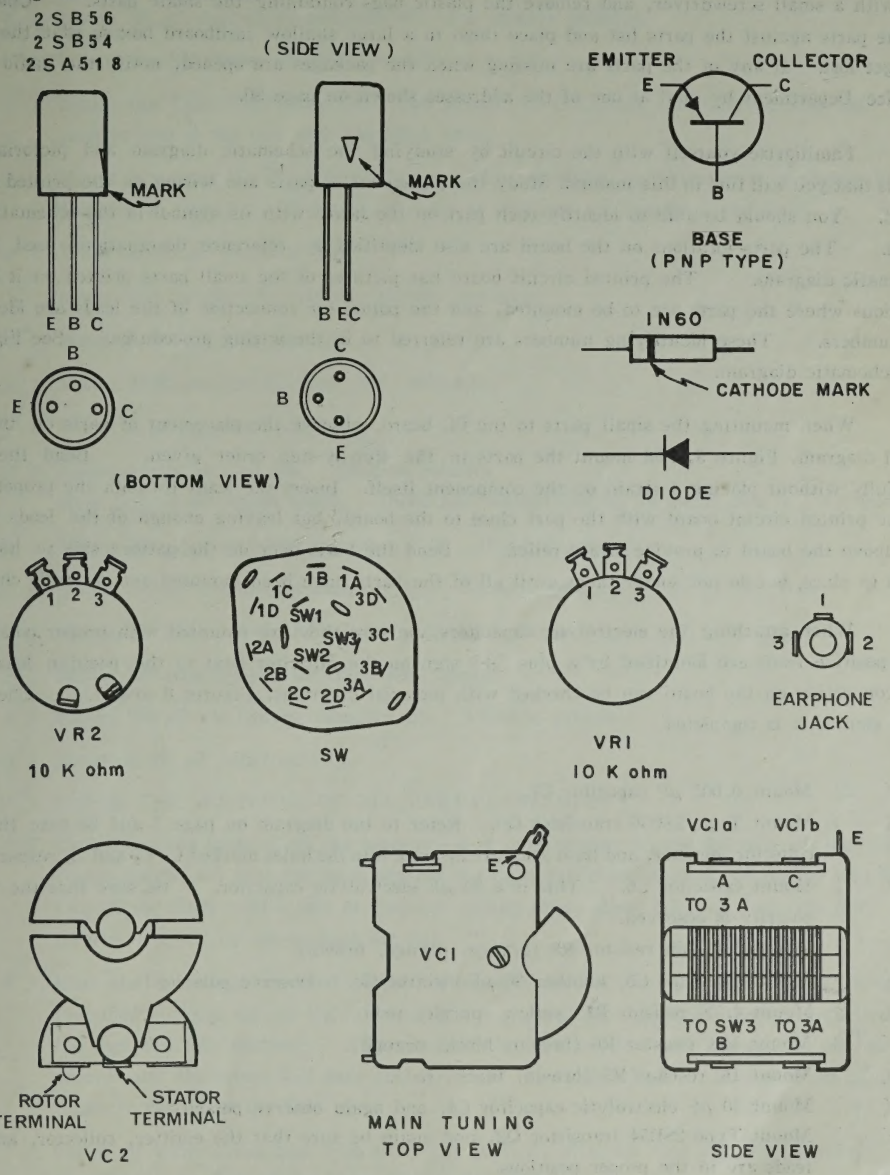


Figure 3 Identification of Terminals for Wiring

WIRING PROCEDURES

To prepare for wiring, remove the back cover of the receiver case by gently prying up the top with a small screwdriver, and remove the plastic bags containing the small parts. Check all of the parts against the parts list and place them in a large shallow cardboard box so that they will not get lost. If any of the parts are missing when the packages are opened, notify the Radio Shack Service Department by mail at one of the addresses shown on page 30.

Familiarize yourself with the circuit by studying the schematic diagram and pictorial diagrams that you will find in this manual. Study the placement of parts and wiring on the printed circuit board. You should be able to identify each part on the board with its symbol in the schematic diagram. The parts locations on the board are also identified by reference designations used in the schematic diagram. The printed circuit board has pictures of the small parts printed on it in the locations where the parts are to be mounted, and the points for connection of the leads are identified by numbers. These identifying numbers are referred to in the wiring procedures. See Figure 4 for schematic diagram.

When mounting the small parts to the PC board, observe the placement of parts on the pictorial diagram, Figure 5, and mount the parts in the step-by-step order given. Bend the leads carefully without placing a strain on the component itself. Insert the leads through the proper holes in the printed circuit board with the part close to the board, but leaving enough of the leads showing above the board to provide strain relief. Bend the leads over on the pattern side to hold the parts in place, but do not solder them until all of the parts have been mounted and carefully checked.

When attaching the electrolytic capacitors, be sure they are mounted with proper polarity. The positive leads are identified by a plus (+) sign on the capacitor next to the positive lead, and the connection on the board can be checked with pictorial diagrams, Figures 6 and 7. Check off each step as it is completed.

1. (√) Mount 0.005 μF capacitor C7.
2. (√) Mount Type 2SB56 transistor Q3. Refer to the diagram on page 5 and be sure that the collector, emitter, and base leads are inserted into the holes marked C, E, and B, respectively.
3. (√) Mount capacitor C6. This is a 30 μF electrolytic capacitor. Be sure that the correct polarity is observed.
4. (√) Mount 330 ohm resistor R8 (orange, orange, brown).
5. (√) Mount capacitor C5, another 30 μF electrolytic. Observe polarity!
6. (√) Mount 4.7K resistor R7 (yellow, purple, red).
7. (√) Mount 10K resistor R6 (brown, black, orange).
8. (√) Mount 1K resistor R5 (brown, black, red).
9. (√) Mount 30 μF electrolytic capacitor C4, and again observe polarity.
10. (√) Mount Type 2SB54 transistor Q2, and again be sure that the emitter, collector, and base leads are in the proper positions.

11. ( ) Mount 10K resistor R4 (brown, black, orange).

12. ( ) Mount 100K resistor R3 (brown, black, yellow).

13. ( ) Mount 30 μF electrolytic capacitor C3, and observe polarity.

14. ( ) Mount the RF choke, identified as RFC.

15. ( ) Mount the Type 1N60 diode D1. The polarity of this diode must also be observed. The positive side is the end with the black band.

16. ( ) Mount transistor Q1 (Type 2SA518). This transistor has three leads as shown in the diagram on page 5. Check the position of this lead on Figures 6 and 7.

17. ( ) Mount 0.005 μF capacitor C2.

18. ( ) Mount 47K resistor R1 (yellow, purple, orange).

19. ( ) Mount 0.005 μF capacitor C1.

20. ( ) Mount 220K resistor R2 (red, red, yellow).

21. ( ) Mount 5 pF capacitor C11.

22. ( ) Mount diodes D2 and D3. Observe polarity signs printed on circuit board. Diode lead welded directiy to metal case is (+) lead.

23. ( ) Mount 200 μF electrolytic capacitor C10. Observe polarity.

24. ( ) Mount 200 μF electrolytic capacitor C9. Observe polarity.

25. ( ) Mount 100 ohm resistor R10 (brown, black, brown).

26. ( ) Mount 220 ohm resistor R9 (red, red, brown).

27. ( ) Mount 200 μF electrolytic capacitor C8. Observe polarity.

28. ( ) Mount 0.005 μF capacitor C12.

29. ( ) CHECK THE MOUNTING OF ALL PARTS CAREFULLY!

30. ( ) Check that the leads of all the parts are bent over sharply on the foil side of the printed circuit board, but that the parts are not too tight and there is no strain on the part itself. Cut all the leads with a pair of diagonal cutting pliers about 1/8 inch from the foil. Be careful that you do not damage the foil.

31. ( ) Heat the soldering iron and solder all leads to the foil. To do this, hold the solder (supplied with the kit) on the foil next to the clipped lead and touch the tip of the iron to the lead and foil together. Do not hold the iron on the lead more than one or two seconds and the solder will melt and flow over the clipped lead. Do not allow too much solder to flow over the lead.

32. ( ) Check all solder joints and wipe away any particles of solder that may have dropped onto the phenolic portions of the board with a dry cloth.

CIRCUIT WIRING

1. ( ) Select from the wire supply the green and white twisted wires. The white wire is 5-1/2 inches long and the green wire is 3-7/8 inches long.

2. ( ) Connect the white wire, on the end that extends beyond the green wire, to resistor R2 at Point No. 1, and the other end of the white wire to terminal 3 of variable resistor VR1. Solder these wires in place.

3. ( ) Connect one side of the green wire to resistor R1 at point No. 2, and the other end of the green wire with terminal 2 of VR1 and solder both ends.

4. ( ) Connect terminal 1 of VR1 to ground at Point No. 3, with bare plated wire. Cut the wire when it is fitted into place and then solder.

5. ( ) Connect terminal 1 of variable resistor VR2 to ground at Point No. 4, with bare plated wire. Cut the wire when it is fitted into place and then solder.

6. ( ) Connect terminal 2 of VR2 and the plus (+) side of 30 μF capacitor C3 at Point No. 5, with bare plated wire; cut to fit and solder. Point No. 5 is located directly under the terminal, and the connection to the capacitor is through the copper foil. Solder all wires as connections are made.

7. ( ) Connect terminal 3 of VR2 to the diode detector D1 at Point No. 6, with bare plated wire. These terminals are also connected by the copper foil.

8. ( ) Connect the rotor side of the main tuning capacitor (variable capacitor VC1) to ground at Point No. 7, with a 1-1/2 inch length of black wire.

9. ( ) Connect the extended terminal on the rotor side of the bandspread capacitor (variable capacitor VC2) to ground at Point No. 8, with a 1-1/2 inch length of black wire. Point No. 8 is located directly underneath the terminal.

10. ( ) Connect terminal 4A (black mark) of coil A and ground at Point No. 9, with a 1-1/2 inch length of black wire.

11. ( ) Connect terminal 4B (black mark) of coil B and ground at Point No. 10 with a 1-1/2 inch length of black wire.

12. ( ) Connect terminal 4C (black mark) of coil C and ground at Point No. 11, with a 1-1/2 inch length of black wire.

13. ( ) Connect terminal 4D (black mark) of coil D and ground at Point No. 12, with a 1-1/2 inch length of black wire.

14. ( ) Connect terminal D of variable capacitor VC1b and terminal 3A of coil A with a 2 inch length of yellow wire.

15. ( ) Connect terminal B of variable capacitor VC1a and terminal SW3 of the band SELECT switch with a 2-3/8 inch length of yellow wire.

16. ( ) Connect terminal A of variable capacitor VC1a and a stator terminal of variable capacitor VC2 (bandspread) with a 5-1/2 inch length of ~~yellow~~ Black wire.

17. (✓) Connect terminal A of variable capacitor VC1a (the same terminal as in the previous step) to 5 pF capacitor C11 at Point No. 13, with a 1-1/8 inch length of yellow wire.
18. (✓) Connect the SW1 terminal of the band SELECT switch to 0.005 μF capacitor C1 at Point No. 14, with a 3-1/8 inch length of green wire.
19. (✓) Connect the SW2 terminal of the band SELECT switch to 0.005 μF capacitor C2, with a 3-1/8 inch length of red wire.
20. (✓) Connect terminal 1A of coil A and terminal 1A of the band SELECT switch with a 1-1/2 inch length of green wire.
21. (✓) Connect terminal 1B of coil B and terminal 1B of the band SELECT switch with a 1-3/8 inch length of green wire.
22. (✓) Connect terminal 1C of coil C and terminal 1C of the band SELECT switch with a 1-3/8 inch length of green wire.
23. (✓) Connect terminai 1D of coil D and terminal 1D of the band SELECT switch with a 1-1/2 inch length of green wire.
24. (✓) Connect terminal 3A of coil A and terminal 3A of the band SELECT switch with a 1-1/2 inch length of yellow wire.
25. (✓) Connect terminal 3B of coil B and terminal 3B of the band SELECT switch with a 1-1/2 inch length of yellow wire.
26. (✓) Connect terminal 3C of coil C and terminal 3C of the band SELECT switch with a 1-1/2 inch length of yellow wire.
27. (✓) Connect terminal 3D of coil D and terminal 3D of the band SELECT switch with a 1-1/2 inch length of yellow wire.
28. (✓) Counect 5 pF capacitor C13 between terminal 2B of coil B and terminal 2B of the band SELECT switch.
29. (✓) Connect 10 pF capacitor C14 between terminal 2C of coil C and terminal 2C of the band SELECT switch.
30. (✓) Connect 100 pF capacitor C15 between terminal 2D of coil D and terminal 2D of the band SELECT switch.
31. (✓) Connect the yellow wire of transformer T1 to the -B2 bus at Point No. 15.
32. (✓) Connect the green wire of transformer T1 to the collector of transistor Q2 at Point No. 16.
33. (✓) Connect the black wire of transformer T1 to resistor R6, capacitor C5, and resistor R7 at Point No. 17.
34. (✓) Connect the red wire of transformer T1 to the base of transistor Q3 at Point No. 18.
35. (✓) Connect the yellow wire of transformer T2 to the -B1 bus at Point No. 19.
36. (✓) Connect the green wire of transformer T2 to the collector of transistor Q3 at Point No. 20.

37. ( ) Connect the red wire of transformer T2 to Point No. 21.
38. ( ) Connect the black wire of transformer T2 to ground at Point No. 22.
39. ( ) Remove the earphone jack from the front panel to make it easy to wire.
40. ( ) Select the 6-inch length of white, black, and yellow twisted wires.
41. ( ) Connect one of the white wire to earphone jack terminal 1.
42. ( ) Connect one end of the yellow wire to earphone jack terminal 2.
43. ( ) Connect one end of the black wire to earphone jack terminal 3.
44. ( ) Connect the white wire from earphone jack terminal 1 to Point No. 23.
45. ( ) Connect the yellow wire from earphone jack terminal 2 to Point No. 24.
46. ( ) Connect the black wire from earphone jack terminal 3 to Point No. 25.
47. ( ) Select the 6-inch twisted pair of black and yellow wires.
48. ( ) Connect one end of each wire to the speaker terminals. It will be easier to wire the speaker if it is first removed. Replace the speaker after wiring is complete.
49. ( ) Connect the yellow wire from the speaker to Point No. 26.
50. ( ) Connect the black wire from the speaker to Point No. 27.
51. ( ) Connect the red wires of transformer T3 to the 1N3193 diode power rectifiers at Points Nos. 28 and 29.
52. ( ) Connect the black wire of transformer T3 to ground at Point No. 30.
53. ( ) Connect the two white of transformer T3 primary to Points Nos. 31 and 32. These wires will have to be cut to fit at these points. After cutting the wire and carefully stripping off 1/4 inch of insulation, be sure to tin the ends of the wires before soldering into place.
54. ( ) Select the 6-inch pair of twisted white wires.
55. ( ) Connect one of the twisted white wires from Point No. 33 to terminal C of variable resistor VR2 (OFF-VOLUME).
56. ( ) Connect the other white wire of the twisted pair from Point No. 34 to terminal A of variable resistor VR2 (OFF-VOLUME).
57. ( ) Connect the AC cord to Points Nos. 35 and 36.
58. ( ) Connect one end of the 8-inch long white wire to Point No. 37, and the other end of the same wire to the antenna terminal (ANT) on the inside of the back cover.
59. ( ) Connect one end of the 8-inch long black wire to terminal E at the top of the main tuning capacitor (This is the terminal from which a black wire is connected to Point No. 7), and the other end to the ground (GND) terminam on the inside of the back cover.
60. ( ) For DC operation, connect wires from a 9-volt battery clip to Points 38 and 39. (The battery must be disconnected when not in use.)

DC OPERATION

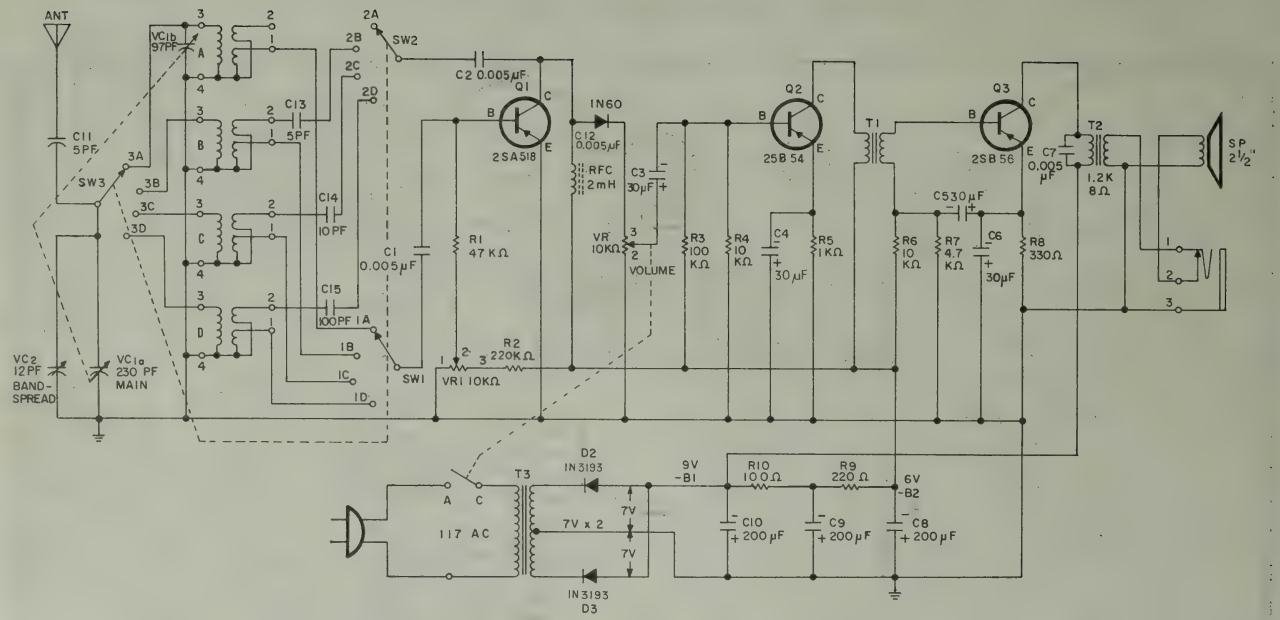


Figure 4 Schematic Diagram

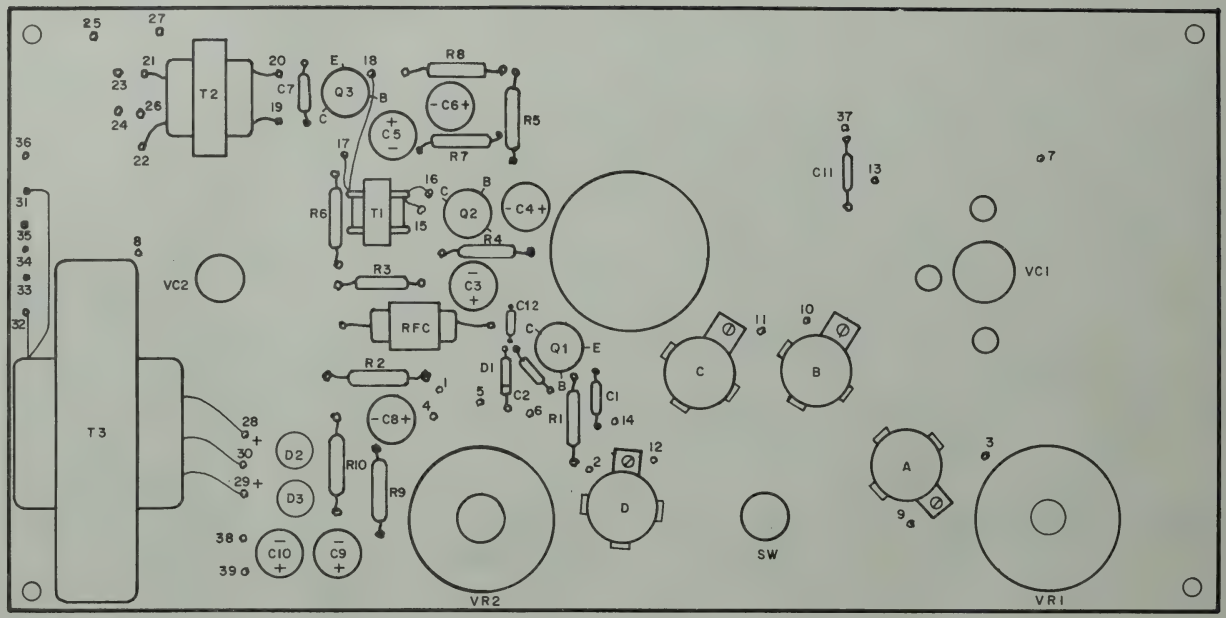


Figure 5 Printed Circuit Board, Actual View

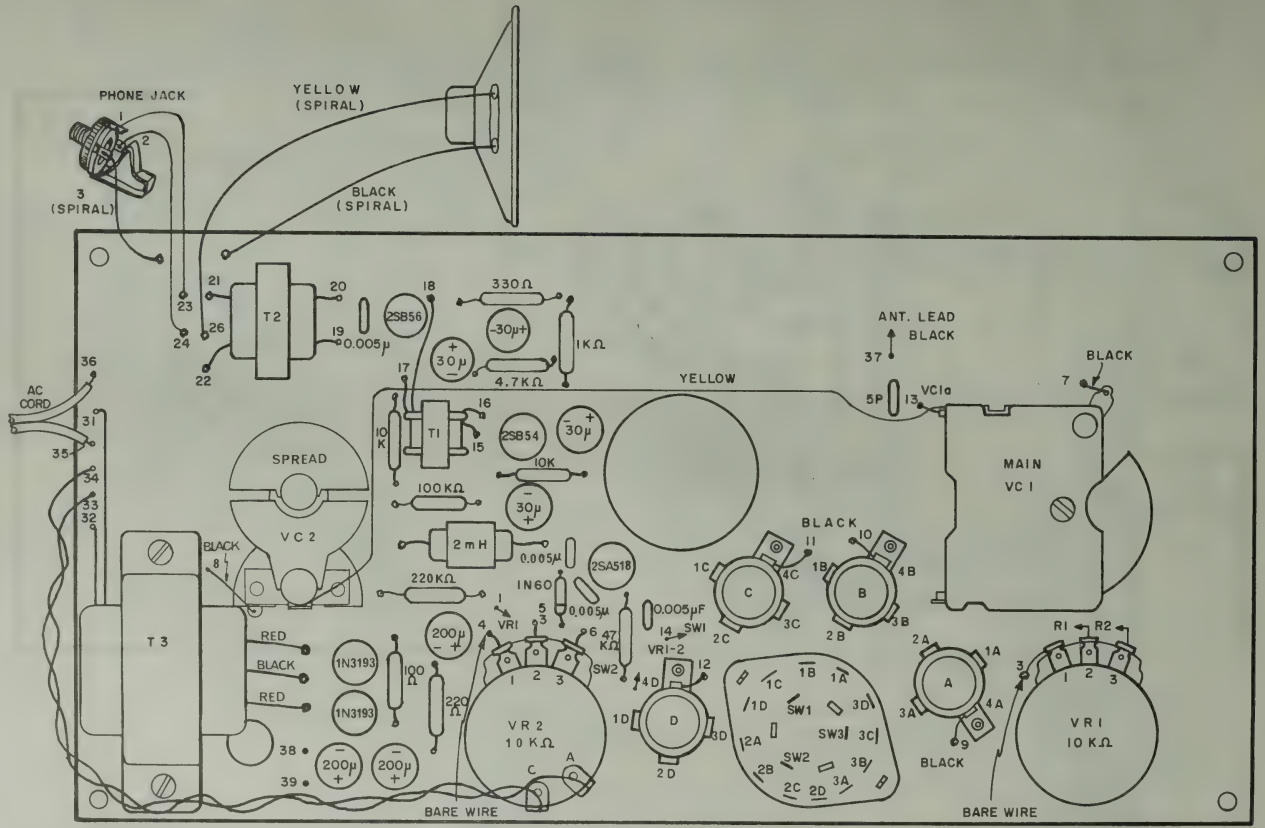


Figure 6 Printed Circuit Board Wiring Diagram

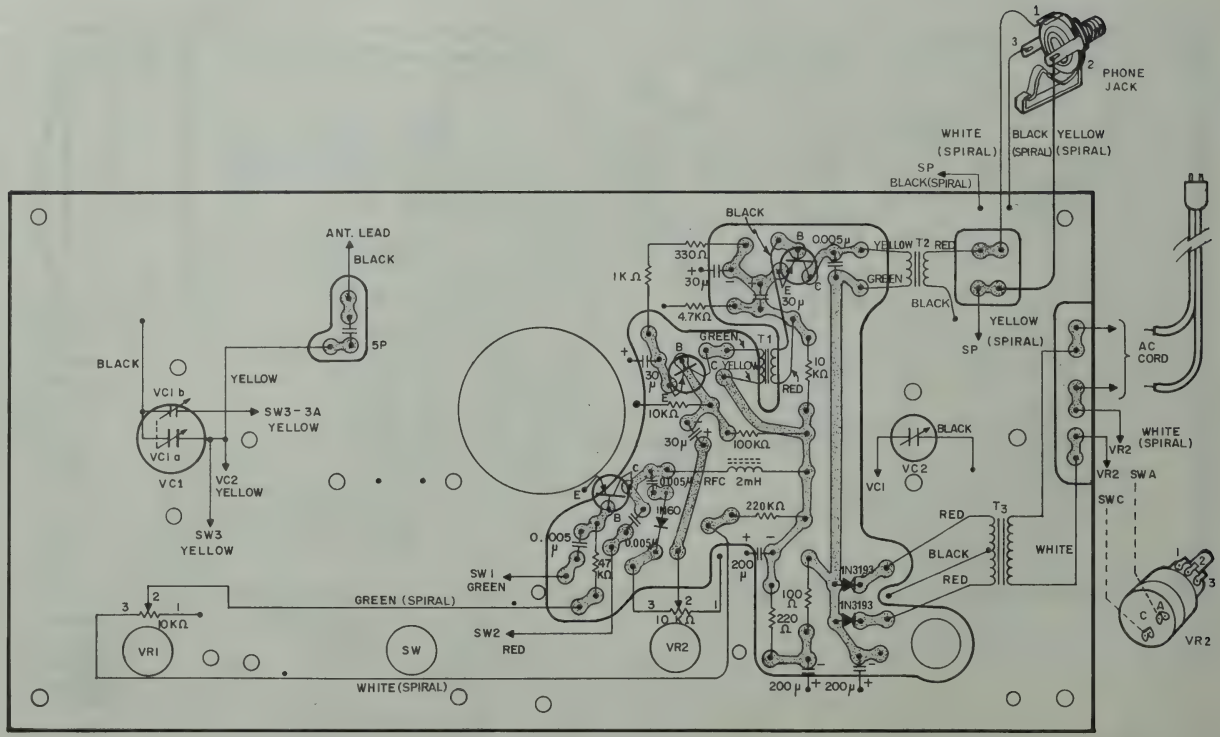


Figure 7 Pattern Side View of Printed Circuit Board with Location of Parts Indicated by Symbols

FINAL ASSMEBLY .

The only steps remaining in completing your Globe Patrol short wave receiver are to mount the printed circuit board, replace the knobs, attach the back cover, and to connect the external antenna. The printed circuit board can be mounted in the case by placing the case on the bench (or table) with the front panel down, and with the foil side of the PC board facing down, slide the PC board over the four long screws that can be seen in the corners inside the front panel. Replace the nuts that were previously removed. When the PC board has been mounted, place the receiver in the upright position. (See Figure 8.)

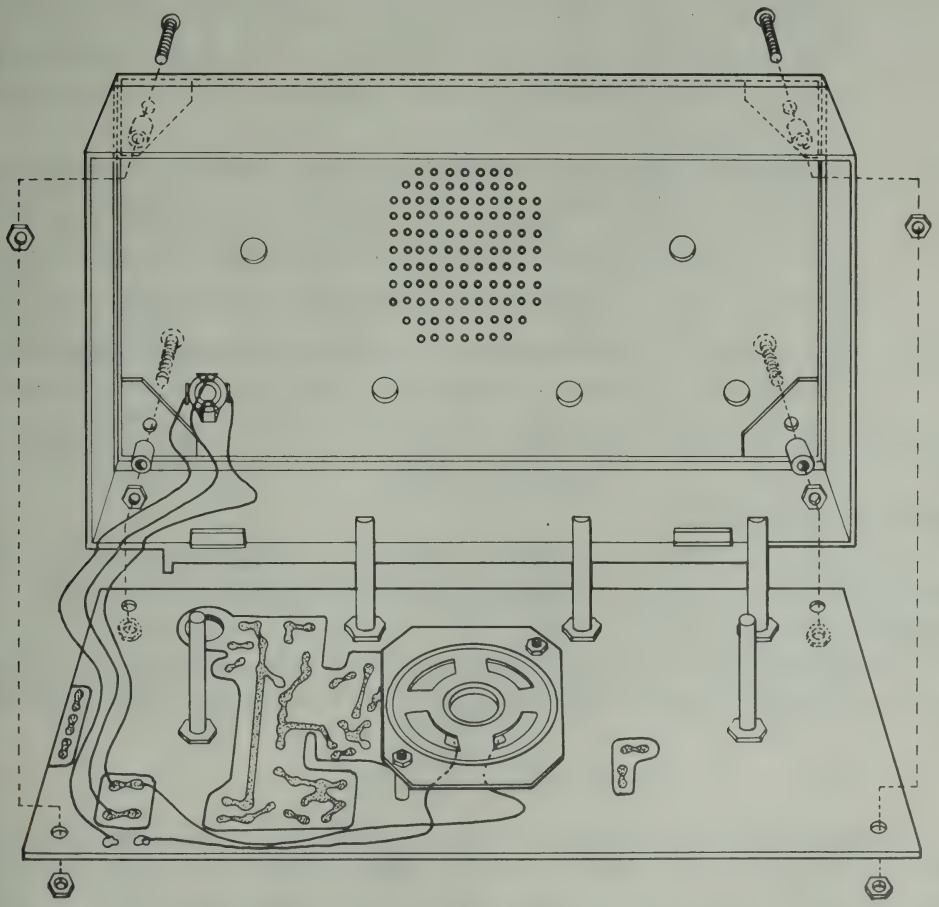


Figure 8 Mounting Printed Circuit Board in Case

ATTACHING KNOBS

1. ( ) Attach the three small knobs by sliding them on the shafts and tightening the set-screws. These knobs should be attached so that the set screws are directly at the bottom, then the pointer lines will be in the proper position for indicating increase and decrease in gain.
2. ( ) The SELECT knob should be aligned so that the white line indicates the band in use (A, B, C, or D), and the pointer line will line up with the letters stenciled on the panel above the knob for each band position.
3. ( ) Next attach a large knob to the shaft of the variable capacitor at the MAIN TUNING dial. Tighten the set screw and turn this knob fully CCW. Loosen the set screw and align the white line on the knob so that it is at the low end of the dial (on the left at the nine o'clock position). Tighten the set screw in this position, then turn the knob clockwise (CW) as far as it will go. It should go all the way to the high end of the dial and stop (at the three o'clock position).
4. ( ) Attach the other large knob to the BANDSPREAD dial. Tighten the set screw and turn the knob so that capacitor plates are completely enmeshed (maximum capacity). This can be observed from the rear. With the capacitor plates completely enmeshed, loosen the set screw and align the white line on the knob with the low end (position 0) on the dial. Tighten set screw. Turn the dial until the white line is aligned with position 10. Again loosen the set screw and position the knob so that the white line is on 0. Tighten the set screw. When the knob is at position 10, the plates are completely un-en-meshed (minimum capacity). When the knob is at position 0, the plates are completely enmeshed (maximum capacity). Positioning of this knob provides frequency calibration while the BANDSPREAD dial is being used for short wave (Bands B, C, and D).

ATTACHING BACK COVER

The back cover is a rectangular piece of fiber board punched for ventilation, and with the antenna terminal posts mounted on it. There are two tabs at the bottom of the board and a cut-out at the top middle made to fit the plastic case.

Hold the board, smooth side out, so that the wires for the antenna connection will stay inside insert the two tabs at the bottom of the board into the slots in the case, and snap the cover into place.

EXTERNAL ANTENNA

This kit has been supplied with a 6 feet length of antenna wire, which should be adequate for local AM or strong short wave station. For optimum reception un external outside antenna is recommended (Radio Shack No. 278-1373). To install outside antenna, see Fig. 9 page 17.

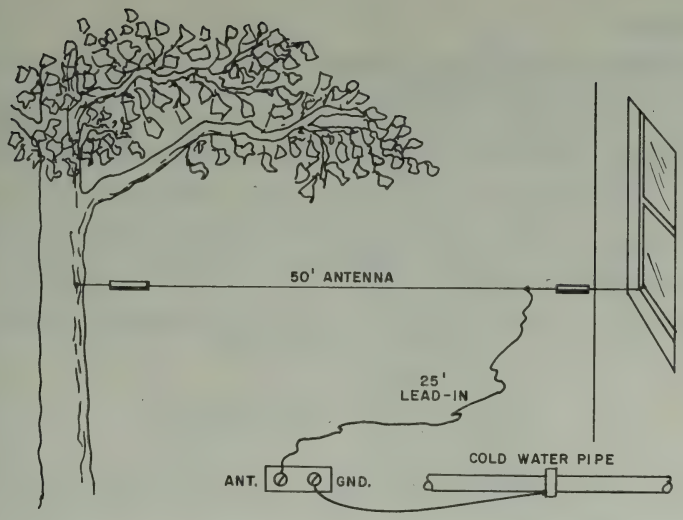


Figure 9 External Antenna for Globe Patrol Receiver

OPERATIONAL USE

There are five operating controls on the Globe Patrol short wave receiver. Their functions and use are described below. There is also a phone jack for earphone listening when desired. See front panel view, Figure 10.

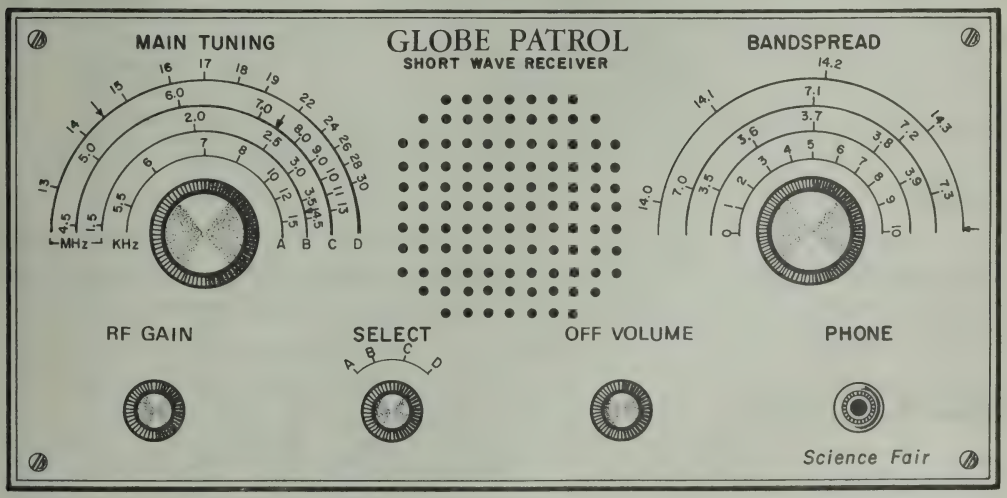


Figure 10 Globe Patrol Short Wave Receiver

MAIN TUNING DIAL

The main tuning control is a variable capacitor which is varied to produce resonance at the various transmitting frequencies of the band in use. This control is used to locate a station and is very sensitive. It is used for tuning most standard broadcast stations and for scanning the short wave bands. When this knob is positioned with the white line at the arrows printed on each dial, the bandspread dial can be used to spread out a small area of the MAIN TUNING dial over the whole BANDSPREAD dial, and fine tuning can be accomplished. This tuning dial has four calibrated frequency ranges, each in a different color to make it easy to use. The bands and color-coding are listed in the table below. (See operating procedures.)

BAND	FREQUENCY CALIBRATION	COLOR
A	540 KHz to 1500 KHz	Black
B	1.5 MHz to 4.5 MHz (arrow at 4.0 MHz)	Green
C	4.5 MHz to 13 MHz (arrow at 7.5 MHz)	Red
D	13 MHz to 30 MHz (arrow at 14.5 MHz)	Blue

BANDSPREAD DIAL

The BANDSPREAD control is also a variable capacitor which is used for fine tuning of the station after an approximate dial location has been set on the MAIN TUNING dial. The colors of the dials on this control correspond to the colors on the MAIN TUNING dial. Calibration of the BANDSPREAD dial is shown in the table below. (See operating procedures.)

BAND	FREQUENCY CALIBRATION	COLOR
A	0 to 10	Black
B	3.5 MHz to 3.9 MHz	Green
C	7.0 MHz to 7.3 MHz	Red
D	14.0 MHz to 14.3 MHz	Blue

RF GAIN

This control is used to adjust the RF sensitivity on all bands. When weak signals are received, advance the control clockwise (CW) until peak audio output is obtained. For strong signals adjust the control counterclockwise for best operation. If gain control is set too high, overloading will occur, resulting in oscillation and loss of audio output.

BAND SELECT SWITCH

This control is used to select the desired band for listening. The letters A, B, C, D above the control knob are the four switch positions which correspond to the letters A, B, C, D on the MAIN TUNING dial.

OFF-VOLUME

This control is a combination switch and potentiometer (variable resistor). When turned fully counterclockwise, the switch is in the OFF position and the radio will not operate. Turning this control clockwise turns on the switch and provides volume control by increasing the volume as it is turned in the clockwise direction, and decreasing the volume as it is turned in the counterclockwise direction.

PHONE JACK

The PHONE jack is provided on the front panel for plugging in the earphone for private listening. When an earphone is used, the speaker is automatically disconnected and the radio cannot be heard except through the earphone.

OPERATING PROCEDURES

When you first operate your receiver, it is recommended that you first tune in the Standard AM Broadcast Band (Band A). This band will be the easiest to tune and the stations will be familiar to you. You will probably notice that you can receive many stations that you had not listened to before. When tuning, use the BANDSPREAD control as a fine tuning control. This will enable you to separate close stations and get a sharp and clear signal.

Tuning the Broadcast Band

To operate the Globe Patrol short wave receiver on the AM Broadcast Band, perform the following steps:

1. Turn the OFF-VOLUME control clockwise to turn on the switch. This radio does not require any warm-up time.
2. Set the band SELECT switch to the band desired. (A for Broadcast Band). The white line on the knob is the pointer.
3. Turn the MAIN TUNING dial in either direction until a station is heard. The broadcast band frequencies are marked on the black dial.
4. Set the RF GAIN control to the point where the signal is strongest without much background noise. Background noise may sound like static or hissing.
5. Set the OFF-VOLUME control to the level desired.
6. Adjust the BANDSPREAD dial for the clearest signal. It may be necessary to separate stations that are close together. This can be done easily by fine tuning.
7. Readjust the OFF-VOLUME control if necessary.

Tuning Short Wave Stations

Tuning of short wave signals is a more precise operation. Short wave radio reception varies with many conditions that are beyond the control of your receiver and which may affect its performance. Examples of these conditions are atmospheric disturbances, barometric high's and low's, lowering of the ionosphere at night-time, sun spots and radiation conditions, and daily and seasonal atmospheric variances. Short wave reception is also more dependent on your own skill in tuning your receiver. Even with highly sophisticated receiving systems, reception is at times very poor or very good. Sometimes "freak" conditions exist in the atmosphere which create good or excellent reception from long distances or directions that would not normally be expected, adding fun and excitement to your short wave listening. Some short wave services such as amateur radio service, do not operate on fixed frequencies, and can be heard at any time within the various bands. For this reason, when tuning short wave stations, there is more dial scanning required to find stations, and especially when the transmitting station is crystal controlled, the frequency limits within which the station can be heard are narrower and tuning must be more precise. The steps required to tune short wave stations can be summarized as follows:

1. With the receiver turned on, select the band you wish to scan by setting the band SELECT switch to B, C, or D.

2. Set the BANDSPREAD control to the high end. The white line on the knob should be at 10. Observe the dial corresponding to the band selected.

3. Slowly rotate the MAIN TUNING control across the entire dial, and repeat up and down the dial as often as necessary. This process is called dial scanning, and when your skill improves, it may be done more rapidly. You may hear clicks and squeals, and sometimes code, voice or music. When you hear the clicks, this is usually a station which you are rapidly passing over. Go back and try to zero in on the click and it may become a voice or other signal. Squeals are somewhat similar. They are caused by the mixing of signals from two or more stations, and tuning down on them may produce a station.

4. When you have located a station and have tuned in as sharply as possible with the MAIN TUNING control, use the BANDSPREAD control to separate stations and to fine-tune the desired station.

5. The continuous wave (CW) code stations which you may receive while dial scanning, can be made to sound higher or lower in pitch (frequency) by use of the BANDSPREAD control.

The BANDSPREAD dial is calibrated on Bands B, C, and D for the three most popular short wave amateur bands. The arrow on Band B is at 4.0 MHz which is the high end of the 75-80 meter band. The arrow on Band C is at 7.5 MHz and it covers the 40 meter band. The arrow on Band D is at 14.5 MHz and it covers the 20 meter band. When you set the MAIN TUNING dial at either of these arrows, the arrow at the high end of the BANDSPREAD dial represents the high end of that band and the calibration marks correspond to the frequencies in that amateur band.

WHERE TO LISTEN

The four bands on the Globe Patrol short wave receiver provide coverage for many interesting world-wide radio services that can be monitored day and night. The services covered by each of the bands are described briefly here. When you are familiar with the use of the receiver, you will be able to find stations more easily and to be able to locate your favorite stations and radio services at regular times, and you will be able to scan the dials for new stations with more success.

BAND A

Band A covers the Standard AM Broadcast Band from 550 KHz to 1500 KHz. Below 550 KHz a few long range code communications stations may also be heard, but are not likely to be intelligible because of their use of high speed transmission devices.

BAND B

Band B includes one or two stations at the high end of the Standard AM Broadcast Band (between 1500 and 1600 KHz), the 160-meter amateur band, the 80-75 meter amateur band, International Short Wave Stations, Ship-to-shore radiotelephone, Aircraft, Maritime Mobile Service (large ships), military stations, and standard time signals.

80-75 METER BAND - Frequency Range: 3.5 MHz to 4 MHz

This band, normally used for distances of 50 to 500 miles, has occasional openings of up to 3000 miles at night. CW is from 3.5 MHz to 3.8 MHz; phone is from 3.8 MHz to 4 MHz.

BAND C

Band C includes amateur stations, International Short Wave stations, Aircraft, Maritime Mobile, Military stations, and standard time signals.

60 METER BAND - Frequency Range: 4.75 MHz to 5.06 MHz. ISW

This is primarily a domestic band broadcasting to local listeners. However, it is often possible to receive such signals at considerable distances. The 60-meter region is designated as the "Tropical Band" since many of the stations using it are located in South and Central America. On occasion, the central and southern parts of Africa are also heard. Best reception on this band is during the winter months in the early evening.

49 METER BAND - Frequency Range: 5.95 MHz to 6.2 MHz. ISW

The behavior of this band is somewhat similar to the 60-meter band. However, it is occupied by very strong International Broadcasting stations and, for this reason, may at times be more consistent.

41 METER BAND - Frequency Range: 7.1 MHz to 7.3 MHz. ISW

A shared band that will, at times, have interference from other services. Amateur radio stations will be heard occasionally between 7 MHz and 7.3 MHz with voice signals between 7.2 MHz and 7.3 MHz.

During the evening hours, strong International Broadcasting stations almost completely take over this band.

40 METER BAND - Frequency Range: 7.0 MHz to 7.3 MHz. Amateur

This band is good for distances of 150 to 2000 miles. As with the lower frequencies, the distance increases during the dark hours with occasional openings up to 5000 miles.

31 METER BAND - Frequency Range: 9.2 MHz to 9.7 MHz. ISW

This band offers the greatest coverage of all. Primarily a night-time band, it offers some daylight listening as well. It also holds up well during the winter evenings, making it one of the best all-round bands in the spectrum.

25 METER BAND - Frequency Range: 11.7 MHz to 11.975 MHz. ISW

The daylight reception is somewhat improved over the lower frequencies. Evening reception is possible at certain times of the year but not as regularly as on the lower bands.

BAND D

Band D includes amateur stations, International Short Wave stations, Military stations, and standard time signals.

20 METER BAND - Frequency Range: 14.0 MHz to 14.350 MHz. Amateur

This band is normally used for distances of 600 to 3000 miles, but has occasional openings of up to 7000 miles. The CW portion is from 14.0 MHz to 14.2 MHz. In the United States, the phone band is from 14.2 MHz to 14.350 MHz. Peak distances are usually at sunrise and sunset. This is primarily a daylight band with nightime activity limited to the late spring, summer and early fall months.

19 METER BAND - Frequeucy Rauge: 15.1 MHz to 15.45 MHz. ISW

Signals over extreme distances are heard after sunrise and throughout the daylight hours. Some night listening is possible during the summer months.

16 METER BAND - Frequency Range: 17.7 MHz to 17.9 MHz. ISW

Signals at this end of the Radio Frequency spectrum are significantly subject to changes in sunspot activity. The generally accepted theory is that, as the number of sunspots increase, the higher frequencies are received over longer distances. Therefore, at the peak of the solar cycle, this band should offer wonderful possibilities of daylight DX (long range reception). (Note: The solar cycle peak occurs at eleven year intervals. The last peak occurred in 1958-59.)

15 METER BAND - Frequency Range: 21.0 MHz to 21.450 MHz. Amateur

Normal distances that can be expected from this band are from 800 to 4000 miles with occasional openings of up to 8000 miles. This is a daylight band with peak distances occurring during the day right up to sunset. Summer time produces a combination of long distance and short distance "skip". During winter evenings the band is usually dead with signals limited to "line of sight" signals, sometimes referred to as "ground waves". The U. S. phone portion of this band is 21.250 MHz to 21.450 MHz.

14 METER BAND - Freqnency Range: 21.450 MHz to 21.7 MHz. ISW

Signals in this band are subject to changes in sunspot activity. At times this band will have stronger signals than the 16 meter band due to a buildup of ionospheric return from frequencies higher than 21 MHz. Many International Stations are now moving into the 14 meter band in anticipation of better sunspot conditions.

10 METER BAND - Frequency Range: 28.0 MHz to 29.7 MHz. Amateur

The CW portion of this band is from 28.0 MHz to 28.5 MHz; the U. S. phone portion is 28.5 MHz to 29.7 MHz. Normal distance Ranges from 1000 to 5000 miles with occasional openings of up to 10,000 miles or better. Summer time produces a phenomenon commonly referred to as "short skip" with intermediate distances of 200 to 800 miles. During winter evenings the band is normally closed with gronnd wave signals limited to 25 to 50 miles. During this period the waver act in a similar manner to VHF (very high frequencies) or television frequencies.

WHAT TO LISTEN FOR

Listening on your Globe Patrol short wave receiver can be a most enjoyable and exciting hobby. You can roam the world from your armchair, listening to exciting news and events as ther are happening. Many foreign broadcasts are in English, and amateur stations operate in over 250 countries around the world. Yon can listen to radio operations from fishing fleets, pleasure craft, rescue operations, and weather broadcasts. Some of the radio services you can hear on your Glode Patrol receiver are listed below.

Amateur Radio

International Short Wave Broadcasting

Ship-to-Shore Mobile Radio Telephone

Aircraft Radio Service

Military Radio Stations

Maritime Mobile Radio Service

Standard Time Signals - WWV and CHU

Citizens Radio Service

International broadcasting offers the most varied entertainment of all the services you will listen to on short wave. Many governments operate powerful short wave transmitters (e. g. the U. S. Government's Voice of America) to keep the world informed of activities within their countries. Many countries also license commercial short wave stations and, in fact, many regions of the world conduct most of their daily broadcasting on short wave instead of on the standard broadcast band. For specific stations and frequencies, you can obtain lists of stations in book and radio stores.

FREQUENCY CONVERSION

Communications receivers are calibrated in Megahertz, or for the Broadcast Band, in Kilohertz, which mean millions of cycles or thousands of cycles, respectively. Wavelengths, however are measured in meters. The distance that a wave covers in meters, before the next radio wave starts is the wavelength. The number of cycles that occur in one second for each meter that the wave travels, is the frequency and may be expressed in cycles (Herts), hundreds, thousands, or millions.

Many stations, particularly International Short Wave Broadcasting Stations, announce their frequency in meters. Amateur operators refer to amateur bands in meters. Kiloherts may de converted to meters by using this simple formula:

$$\frac{300,000}{\text{Frequency in Kilohertz}} = \text{Wavelength in meters}$$

Example:

$$\frac{300,000}{1500\ \text{KHz}} = 200\ \text{meters}$$

Megahertz may be converted to meters by the following formula:

$$\frac{300}{\text{Frequency in Megahertz}} = \text{Wavelenght in meters}$$

Example:

$$\frac{300}{7.1\ \text{MHz}} = 42.25\ \text{meters}$$

The conversion from

The conversion from meters to Megahertz (or Kilohertz) uses the same formula:

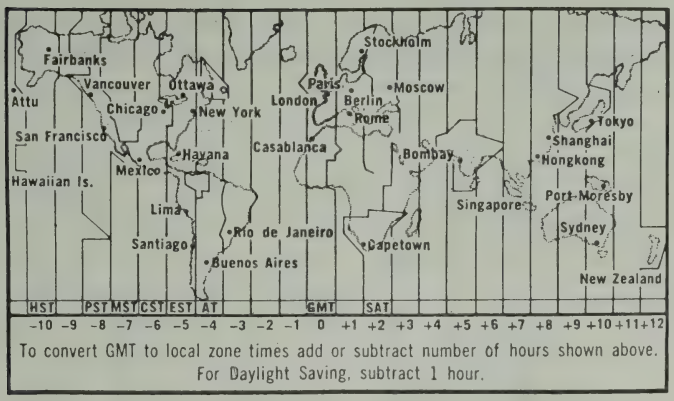
Example:

$$\frac{300}{42.25\ \text{meters}} = 7.1\ \text{Megahertz}$$

TIME CONVERSION

A 24-hour clock is used to tell communications time. One AM is 0100; four AM is 0400; Noon is 1200; 3:30 PM is 1530; 8:45 PM is 2045. This simple method precludes any confusion between AM and PM. (See chart below.)

GMT (Greenwich Mean Time - the time at Greenwich Observatory, England) is the basis for telling time in International Broadcasting. To convert from GMT to local time or any other time zone, add or subtract the hours shown on the INTERNATIONAL TIME MAP below.



Example: 2300 GMT is 1800 EST (Eastern Standard Time). This is equivalent to 11: 00 PM in London, England, 6:00 PM in New York or 7:00 AM in Tokyo (the next day).

THEORY OF OPERATION

OVERALL CIRCUIT

The Globe Patrol short wave receiver is a regenerative circuit with three transistor stages, a detector stage, an antenna input circuit, an output circuit, and a power supply. The receiver is constructed of basic and rugged circuits for dependable operation, but by the use of well-engineered design principles, gives high performance despite its relatively simple construction. The electronic principles upon which the receiver is designed, is described stage-by-stage in the following paragraphs.

ANTENNA TUNING CIRCUIT

The antenna tuning circuit need not create undue concern for complexity, for in reality, it consists of four simple circuits arranged so that only one of them will be used at a time, just by switching the band SELECT switch. To understand its operation, consider the circuit of only one band, band A for instance. This is the broadcast band whose limits are 550 KHz to 1600 KHz. In this receiver Band A can be tuned from 540 KHz to approximately 1500 KHz.

If the other three band coils were not in the circuit, the simple tuning circuit for the Broadcast Band would be as shown in Figure 11. In this simplified circuit, the signal from the antenna is coupled into the tuning circuit through 5 pF capacitor C11. A condition of resonance is produced in the inductive-capacitive (LC) tuning circuit. The tuning circuit consists of the MAIN TUNING capacitors VC1 a and VC1b in parallel with the primary winding of the Band A coil. The series combination of the variable BANDSPREAD capacitor VC2 provide a small amount of additional capacitance which is used for fine tuning over small areas of selected bands.

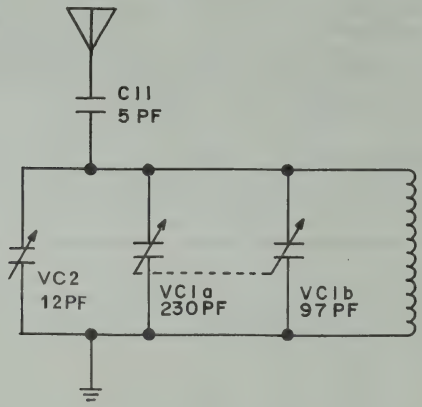


Figure 11 Tuning Circuit for Broadcast Band, Simplified

For the short wave bands, the 97 pF variable capacitor VC1b is not needed, and switching the band SELECT switch to B, C, or D, eliminates it from the circuit. The simplified tuning circuit for the short wave bands would be as shown in Figure 12.

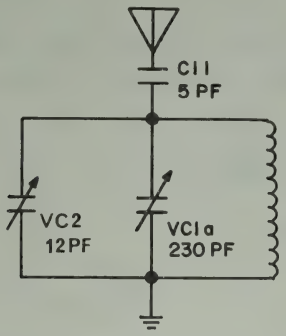


Figure 12 Tuning Circuit for Short Wave Bands, Simplified

RADIO FREQUENCY (RF) AMPLIFIER

Transistor Q1 is an RF amplifier. It is a grounded emitter circuit in which the amplified output is taken from the collector. When the transistor goes into conduction by correct adjustment of the bias with the RF GAIN control, a small portion of the output is coupled back through 0.005 μF capacitor C2 to the tickler coil. This starts and sustains oscillation at the frequency of resonance as selected by the tuning controls. The tuned signal is coupled to the base of the transistor through 0.005 μF capacitor C1. The bias circuit, which controls the amount of voltage on the base of the transistor and thus controls its operating point, consists of resistors R1, R2, and variable resistor VR1, which is the RF GAIN control. The amplified collector output voltage is also controlled at -6V by action of the RF choke, which is part of the detector circuit. A simplified diagram of the RF amplifier circuit is shown in Figure 13.

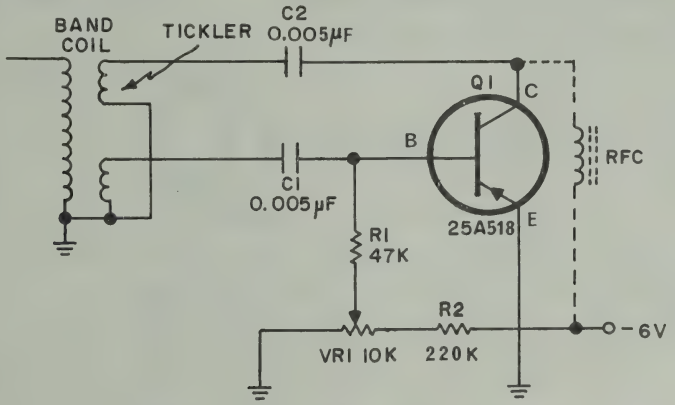


Figure 13 RF Amplifier Circuit, Simplified

DETECTOR CIRCUIT

The audio detector circuit illustrated in the simplified diagram of Figure 14 consists of a 2 mH RF choke, the 1N60 diode, and the 10K variable resistor VR2, which is used to control the volume. The RF choke controls the output of the transistor Q1 collector at -6 volts and isolates the RF from the -6 volt DC source. The 1N60 diode is a point contact germanium diode which detects the audio and does not pass high frequency RF signal. The 10K variable resistor VR2 at the output of the detector circuit provides low-level volume control at the input to the first audio amplifier stage.

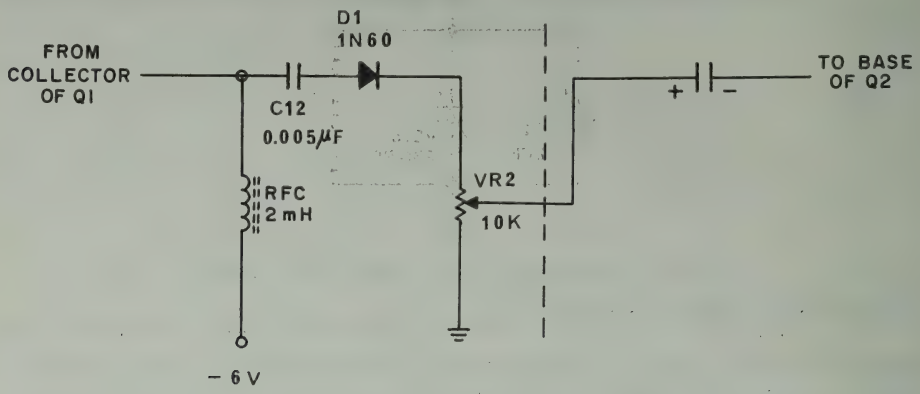


Figure 14 Detector Circuit, Simplified

FIRST AUDIO AMPLIFIER

The first audio amplifier amplifies the demodulated RF signal. It is a low level class A amplifier, whose input signal is taken at the 10K variable resistor VR2 and coupled to the base of transistor Q2 (a medium gain 2SB54 PNP transistor) through 30 μF coupling capacitor C3. Resistors R3 and R4 determine the base-emitter bias for the transistor. Resistor R5 is the emitter stabilizing resistor which is by-passed for RF by the 30 μF capacitor C4. The output signal is developed across coupling transformer T1, which acts as the collector load impedance. The collector voltage and the emitter current are kept relatively low to reduce the noise figure.

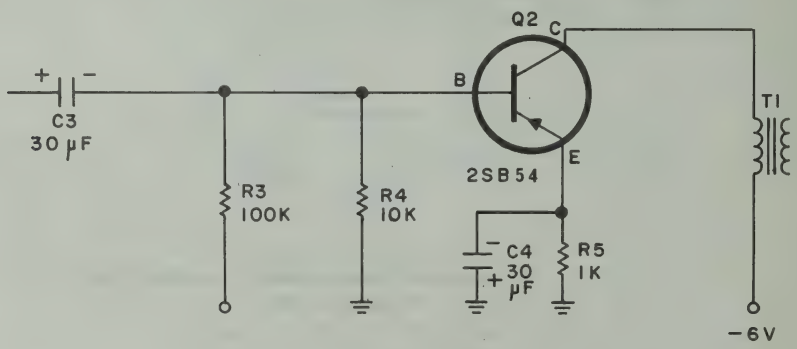


Figure 15 First Audio Amplifier, Simplified

POWER OUTPUT STAGE

This is a single-ended power amplifier circuit. Transformer coupling between the Q2 and Q3 transistor stages provides high power efficiency and matches the load of the first stage to the input of the second stage, giving high power gain. The secondary winding of transformer T1, coupled to the base of Q3 introduces the audio signal to the base and also acts as the base DC return path. The power output stage is a high gain 2SB56 transistor, transformer coupled to the PM speaker. Base-emitter bias is provided by resistors R6 (10K) and R7 (4.7K) respectively. Resistor R8 is the emitter stabilizing resistor, bypassed by 30 μF capacitor C6 for frequencies above the audio range. The 30 μF capacitor C5 prevents loss of signal in the bias network. Transistor Q3 collector output is coupled to the speaker by matching transformer T2 whose primary is shunted by 0.005 μF capacitor C7 for high frequency attenuation and to protect against distortion in the speaker. See the simplified diagram, Figure 16.

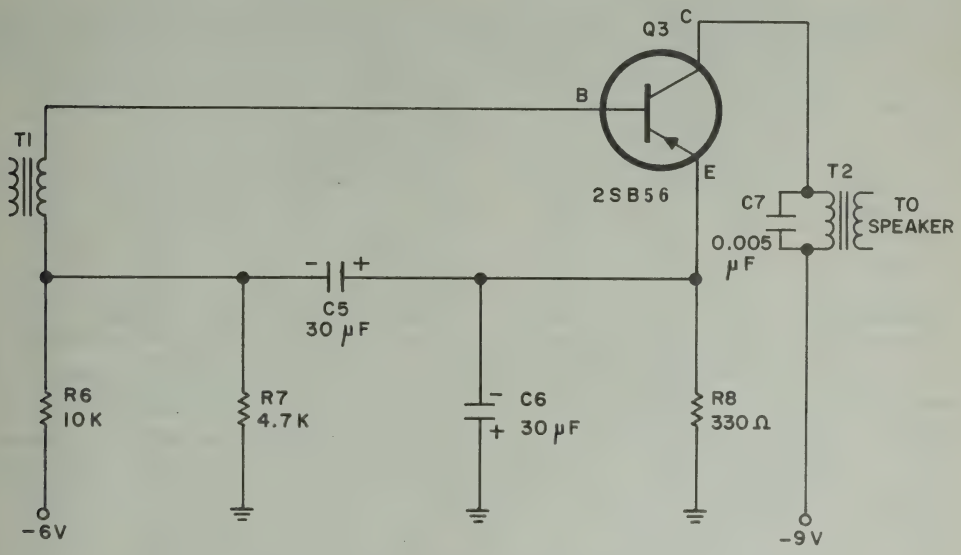


Figure 16 Power Output Stage, Simplified

POWER SUPPLY

A full-wave rectifier, using two silicon diodes, and with a two-section RC (resistance-capacitance) filter, supplies the power to operate the Globe Patrol receiver. Voltage is taken at two points in this circuit, one at the output of the diodes before filtering, where it is approximately -9 volts (it may be as low as 8.6 volts without any adverse effects), and the other poiut is after the filter sections where a -6 volts is available for the bias circuits.

ALIGNMENT AND TESTING

Operation of the Globe Patrol receiver requires very little alignment, the only adjustment being the screwdriver control on the MAIN TUNING capacitor (See Figure 6). If the receiver works well when it is first assembled there will be no need to make this adjustment, but if the signal is not clear, turn the adjustment screw slowly on a signal until there is the least amount of background noise and the signal is clear. This adjustment is called a trimmer capacitor, and is used to compensate for small capacitance differences and permit the ganged capacitors to "track" precisely to the same frequency.

Voltage checks can be made with a vacuum tube voltmeter (VTVM) at certain points in the circuit. When isolating a fault, do not consider a stage bad when there is no signal output; go back to the previous stage and check its operation. Check all stages before narrowing down to the actual malfunctioning component. The convenient points for making voltage checks are listed in the table below.

TEST POINT	VOLTAGE	TEST POINT	VOLTAGE
T3 pri. Pt. 31 to 32	110-120 AC	Q2 emitter	0.8
T3 sec. to CT - Pt. 28	7	Q2 base	0.9
T3 sec. to CT - Pt. 29	7	VR2 - terminal 2	-
-B1 to ground - Pt. 38	9	VR2 - terminal 3	-
-B2 to ground - Pt. 16	8.4	VR1 - terminal 1	0.4
Q3 collector	8.3	VR1 - terminal 2	0.25
Q3 emitter	2.4	Q1 collector	8.4
Q3 base	2.6	Q1 emitter	0
T2 - Pt. 21	-	Q1 base	0.2
Q2 collector	8.2	(From -B1 all measurements to ground)	

The circuitry used in the Globe Patrol receiver is of straightforward rugged design. Components are first quality, conservatively rated. If you have followed all of the instructions carefully in assembly, you should have little diffculty and it will give you top performance and years of enjoyable service. If however, you should experience difficulty with the circuitry and operation of the receiver, and you are unable to correct the problem with the normal procedures outlined in this manual, write to SCIENCE FAIR™ ELECTRONICS at the address nearest you that is listed below, describing your difficulty in detail. All possible assistance will be given to you by our engineering staff. If necessary you may be instructed to return the kit to the service department where it will be put in working order for a nominal service charge. A $5.00 minimum charge will be applied to all receivers returned for repair, and a standard hourly rate will be charged for completing unfinished construction. No kit will be serviced if acid core soldes has been used.

Address correspondence to SCIENCE FAIR™ ELECTRONICS, Service Department

730 Commonwealth Ave.
Boston, Massachusetts

2615 W. Seventh Street
Fort Worth, Texas 76107

7340 Lampson Street
Garden Grove, Calif.

PARTS LIST

REF. DES.	DESCRIPTION	QTY.	FUNCTION
C1	Capacitor, 0.005μF, 50 V ceramic	3	Base coupling
C2	Same as C1		Feedback coupling
C3	Capacitor, electrolytic, 30μF, 10V	4	Base coupling
C4	Same as C3		Emitter by-pass
C5	Same as C3		Emitter-base signal stability
C6	Same as C3		Emitter resistor by-pass
C7	Same as C1		High frequency compensation
C8	Capacitor, electrolytic, 200μF, 10V	3	Power supply filter
C9	Same as C8		
C10	Same as C8		
C11	Capacitor, 5pF, disc ceramic	1	Antenna coupling
C12	Capacitor, 0.005μF disc ceramic	1	Blocking capacitor
C13	Cadacitor, 5pF disc ceramic	1	Feedback adjust
C14	Capacitor, 10 pF disc ceramis	1	Feedback adjust
C15	Capacitor, 100 pF disc ceramic	1	Feedback adjust
VC1a	Capacitor, variable, 230 pF (ganged)	1	Main tuning
VC1d	Capacitor, variable, 97 pF (ganged)		Main tuning
VC2	Capacitor, variable, 12 pF	1	Bandspread tuning
D1	Diode, point contact germanium 1N60	1	Audio detector
D2	Diode, Type 1N3193	2	Power rectifier
D3	Same as D2		
R1	Resistor, 47 K ohm, 1/4 W	1	Bias
R2	Resistor, 220 K ohm, 1/4 W	1	Bias
R3	Resistor, 100 K ohm, 1/4 W	1	Bias
R4	Resistor, 10 K ohm, 1/4 W	2	Bias
R5	Resistor, 1 K ohm, 1/4 W	1	Emitter stabilizing
R6	Same as R4		Bias
R7	Resistor, 4.7 K ohm, 1/4 W	1	Bias
R8	Resistor, 330 ohm, 1/4 W	1	Emitter stabilizing
R9	Resistor, 220 ohm, 1/4 W	1	Ppwer supply filter
R10	Resistor, 100 ohm, 1/4 W	1	Power supply filter
VR1	Resistor, variable, 10 K ohm	2	RF Gain Control
VR2	Same as VR1		Volume Control
T1	Transfosmer, coupling, 10 K : 1 K	1	Interstage coupling
T2	Thansformer, output, 1.2 K : 8 ohms	1	Output coupling
T3	Transformer, power, 115 V : 14 V CT	1	Power step-down
Q1	Transistor, Type 2SA518	1	RF Amplifier
Q2	Transistor, Type 2SB54	1	First audio Ampl.
Q3	Transistor, Type 2SB56	1	Power Amplifier

PARTS LIST, CONT

REF. DES.	DESCRIPTION	QTY.	FUNCTION
A	Antenna tuning coil	1	Band A Coil
B	Antenna tuning coil	1	Band B Coil
C	Antenna tuning coil	1	Band C Coil
D	Antenna tuning coil	1	Band D Coil
S P	Loudspeaker, 2-1/2 inch PM	1	Audio output
	Earphone	1	Audio output
J 1	Phone Jack	1	Earphone connect.
SW1 SW2 SW3	Bandswitch, ganged, wafer type rotaty, 4 position, common shaft	1	Band coil switching
R F C	RF Choke, 2 mH	1	p/o audio detector
	Knob, large	2	Tuning dials
	Knob, small	3	Selector switch, RF Gain control, Volume control
	Power cord, AC, 4 feet	1	Connection to AC
	Printed circuit board	1	Electrical chassis
	Front panel, alminum	1	Control panel
	Screws for front panel and PC board	4	Mounting hardware
	Nuts for front panel screws	8	Mounting hardware
	Screws for speaker and power trans.	4	Mounting hardware
	Nuts for speaker and power trans.	4	Mounting hardware
	Plastic case	1	Radio cabinet
	Back cover	1	Back cover
	Antenna wire	1	Antenna
	Hookup wire and solder (as needed)		Wiring
	Instruction manual	1	Procedures

GLOBE PATROL - Important Instruction Addenda

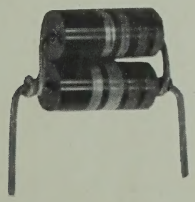
After completing your Globe Patrol, experimentation with the extra parts contained in the small polybag supplied with this kit may improve shortwave reception.

The circuitry employed in the Globe Patrol is of regenerative design which obtains its high sensitivity to shortwave signals by feeding back a small portion of the signal into the circuitry for reamplification. A regenerative circuit always works best if all component parts are matched or "tuned" to the circuit. As there is some degree of variance (tolerance) in electronic parts, the extra parts included may help to obtain a better component match--thereby improving the reception.

If you are unable to obtain satisfactory shortwave reception after construction, make the circuit adjustments as indicated below in the step-by-step directions. Check for improvement of performance after each step is completed. If no improvement is noted, replace the original part and go on to the next step. Before attempting these changes, make certain that your Globe Patrol has been properly constructed and is operative on local AM stations (Band A) and a suitable external antenna has been connected.

Step-By-Step Adjustments

A (✓) Install a 78K resistor in parallel with resistor R2 (220K).
B (✓) Remove capacitor C11 (5pF) and replace with a 10pF capacitor.
C (✓) Install a .02 uf capacitor in parallel with capacitor C12 (.005).
D (✓) Remove capacitor C13 (5pF) and replace with a 3pF capacitor. This change effects only band B.
E (✓) Remove capacitor C14 (10pF) and replace with a 7pF capacitor. This change effects only band C.
F (✓) Remove capacitor C15 (100pF) and replace with 5pF capacitor. This change effects only band D.



PARALLEL RESISTOR CONNECTION
(STEP A)

PARALLEL CAPACITOR CONNECTION
(STEP C)

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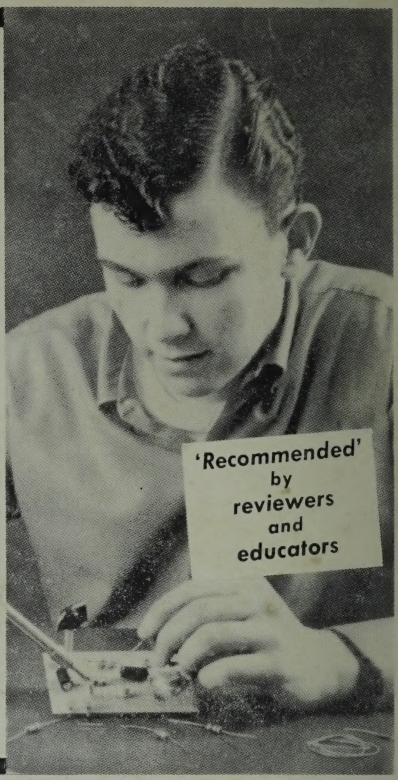

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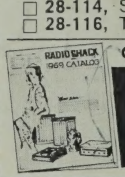

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